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ABSTRACT

This paper uses data from the Schools and Staffing Survey (SASS) to examine two main facets of teacher qualifications: teacher certification and degree level. After noting the importance of teacher qualifications to student achievement and to public confidence in the educational system, Section 1 looks at sources of partly certified teachers. One of the main sources is the substantial group of people who enter the ranks of teachers employed in public schools each year. Entering teachers are much more likely to be partly certified than are continuing teachers. Section 2 discusses predictors of teacher qualifications. Data from the SASS suggest that the main predictor variable is teaching experience. Others include race, increasing urbanization, and full-time versus part-time employment. Section 3 highlights issues related to teacher certification and turnover, explaining that the percentage of partly certified teachers is three times greater for transitional teachers than for established teachers. (SM)

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CRITICAL FACTORS IN DEVELOPING A HIGHLY QUALIFIED NATIONAL TEACHING FORCE

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Introduction

Teacher shortage has been a chronic problem in the United States for decades. It has been clear since the advent of the first Schools and Staffing Survey (SASS)[1] in 1987-88 that the shortage is not one of numbers of individuals willing and able to enter the ranks of employed teachers. This is demonstrated by the fact that less than 0.5% of all teaching positions in the nation are vacant during a school year. Instead, there is a shortage of qualified teachers, especially as indicated by the facts that (as of 1994-94) (a) slightly over 7% of the teachers employed in public schools were not fully certified in their main teaching assignments, (b) slightly less than 50% of public school teachers had earned a master's degree, and (c) over 25% of secondary students in public schools were enrolled in courses taught by teachers who had not earned even a minor in the general subject matter being taught.

The purposes of this paper are to examine two main facets of teacher qualifications with SASS data: teacher certification and degree level. The importance of teacher certification to student achievement has been demonstrated in a review by Darling-Hammond (2000), while the importance of teacher degree level has been demonstrated by a review by Greenwald, Hedges, & Lane (1996). Qualifying for full certification is regarded as the most basic teaching credential because it is required by all states for teaching practice, though states do provide waivers when fully certified teachers are not available.

In addition to being an important determinant of student achievement, teacher qualifications are important as well to public confidence in the educational system. One indicator of this is the movement to tell parents whether their children are instructed by fully certified teachers who have earned a major or minor in the subject matter of instruction.

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[1]SASSs has been administered by the National Center for Education Statistics (NCES), U.S. Department of Education.

Teacher qualifications are but part of the more generic and abstract concept of teacher quality. As used here, qualifications represent a major facet of teacher quality, as follows:

Components of Teacher Quality

- Teacher Qualifications
  - State certification (or licensure) level
  - Degree Level
  - Major or minor, in relation to teaching assignment
  - Completion of teacher preparation program
  - Teaching experience
- Tested teacher ability
- Effectiveness of instructional performance

Good measures of most teacher qualifications are readily available for national- and state-level analyses from SASS. Unfortunately, tested ability measures for teachers are not widely available, and there are no simple and reliable measures of instructional performance available for use on a large scale.

Sources of Partly Certified Teachers

Information collected through the "Public School Teachers Questionnaire" of the 1993-94 SASS, shows that the main source of partly-certified teachers[2] has been the substantial group of about 160,000 individuals that enter the ranks of teachers employed in public schools each year (called "entering teachers"). Compared with continuing public school teachers (i.e., individuals employed as teachers from one year to the next), the percentage of partly certified entering teachers is quite high, as shown in Table 1.

Among continuing public school teachers, a distinction can be made between those who have become established in their positions (i.e., teachers who have remained in the same school and same main teaching assignment for three or more years) and those who have been in transition (i.e., teachers who have not been stable in the same position for at least three years). As might be expected, the percentage of partly-certified transitional teachers is three times higher than the same percentage of established teachers, also shown in Table 1.

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[2]Fully certified teachers employed in public schools are defined as those who have received either an advanced, regular, standard, or probationary certificate in their main teaching assignment from the state in which they are employed. All other teachers are classified as partly certified.

Table 1. **PERCENTAGES OF PARTLY CERTIFIED TEACHERS IN US PUBLIC SCHOOLS: 1993-94**

	Partly Certif. Percentage
I. Entering Teachers	
A. First Time Teachers	
1. With teacher preparation majors	25%
2. With other majors	42%
B. Experienced Teachers	
1. Reentering	20%
2. Private School Migrants	20%
II. Continuing Teachers	
A. Established Teachers	<5%
B. Transitional Teachers	14%

Data Source: 1993-94 Schools and Staffing Survey

The data presented in Table 1 about the certification qualification of entering and continuing teachers support the following conclusions:

- A substantial percentage (about 25%) of entering teachers annually are only partly certified, a level much higher than that of continuing teachers (about 5% partly certified) and even much higher than teachers who leave teaching annually (about 10% partly certified). This annual inflow of underqualified teachers dilutes the level of qualifications of the employed teaching force, and indicates that the development and retention of a stable teaching force is a vital approach to improving teacher quality.

- The contribution of a stable teaching force to a high certification level is also seen in the difference in certification between established and transitional teachers.

- Formal teacher preparation is much more likely to yield fully-certified entering teachers than is degree study without such preparation.

- Among entering teachers, those who enter with prior teaching experience from the reserve pool are more likely to be fully certified than are first time teachers. Thus, teaching experience (a teaching qualification itself) is one determinant of another qualification: full certification.

Predictors of Teacher Qualifications

The development and retention of a highly qualified teaching force in public schools might be facilitated by better knowledge of factors that are predictive of, and may influence, teacher qualifications. Accordingly, an exploratory study with 1993-94 SASS data was made of two teacher qualifications: (a) certification level (part vs. full certification) and (b) highest degree level (bachelors degree or less vs. masters degree or higher). A number of predictor variables was created from SASS in the general categories of teacher demographic attributes, teacher working conditions, and broad teaching assignment field. Multivariate models were constructed using these variables to predict the two teacher qualification variables by the following process:

1. Each of the two teacher qualifications was coded as a binary dependent variable as follows:

   - Certification: Part (0) vs. Full (1)

   - Degree level: Bachelors or lower (0) vs. Masters or higher (1)

   Logistic regression was used to construct the predictive models for these two binary variables.

2. The bivariate relationship of each of the qualifications variables with each of the predictor variables was first explored.

3. Predictor variables in statistically significant and substantial relationships with a qualification variable were selected for inclusion in full multivariate logistic regression models. Teacher age and salary were excluded because they were highly correlated with teacher experience. Teacher experience was a stronger predictor than teacher age; teacher experience drives teacher salary by policy, instead of vice versa.

4. In the interest of parsimony, reduced multivariate models were computed by eliminating variables that did not contribute to the predictive validity of the models (as measured by the coefficient of concordance) and/or to the fit of the models to the data (Hosmer-Lemeshow Goodness-of-Fit test).

An outline of the main results of the modeling teacher certification and degree level with logistic regression is shown in Table 2, while much more detailed information about these models is presented in Table 3. As seen in these tables, the predominant predictor of these two teacher qualifications is teaching experience. By comparison, other predictors such as increasing urbanization are inconsistent across the columns of the tables and less potent. Race is moderately related to teacher certification, but not to degree level. Regular full-time teachers are somewhat more likely to be fully certified than are irregular and/or part time teachers, but employment status was essentially unrelated to degree level. And physical education teachers tend to be much more fully certified than special education teachers, but much less likely to hold masters (or higher) degrees.

The critical factor appearing in these analyses is teaching experience. As teachers gain years of experience, they clearly tend to earn strong credentials.[3] A policy implication of this finding is that the development and retention of an experience faculty in a school pays off in higher qualifications. The tradeoff is that such policies, if effective, also cost more in salary and benefits. The added cost can be easily justified because teacher experience is related to improved student achievement (as are other dimensions of teacher qualifications), as demonstrated in the review by Greewald et al. (1996).

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[3]An interesting exception to the importance of teaching experience to developing teacher qualifications is the correspondence or match between a teacher's content area of certification and main teaching assignment. A match, or mismatch (often termed out-of-field teaching), of these two variables represents one type of teacher qualification. Our exploratory bivariate analysis of this qualification variable (a match vs. a mismatch), also with 1993-94 SASS data for the public school teaching force at the elementary and secondary levels separately, revealed that it was independent of the amount of teaching experience--a fact in dramatic contrast with teacher certification and degree level. Thus, it appears that developing a more experienced and stable teaching force is not one remedy for out-of-field teaching. This phenomenon deserves further analyses with SASS data.

Table 2. **SUMMARY OF LOGISTIC REGRESSION RESULTS: STRENGTH OF PREDICTORS OF TEACHER QUALIFICATIONS**

	TEACHER QUALIFICATION			
	FULL CERTIF		DEGREE LEVEL	
PREDICTOR VARIABLE	ELEM	SEC	ELEM	SEC
1. INCREASING URBANIZATION	-	-		+
2. RACE: WHITE/NON-WHITE	++	++		
3. INCREASING TEACHING EXPERIENCE	+++	+++	+++	+++
4. REGULAR FULL TIME EMPLOYMENT	+	+		
5. SELF CONTAINED CLASSROOM	+			
7. TEACHING FIELD				
GENERAL ELEMENTARY	+			
GENERAL SECONDARY				
PHYSICAL EDUCATION	++	++	--	--
VOCATIONAL EDUCATION		+	--	-
SPECIAL EDUC (REFERENCE)				
CONCORDANCE INDEX (c)	.79	.75	.67	.69

Data Source: 1993-94 Schools and Staffing Survey

\- or + weak association (OR 0.5-0.66, or OR 1.5-2.0)

-- or ++ moderate association (OR 0.25-0.49, or OR 2.1-4.0)

--- or +++ strong association (OR <0.25, or > 4.0)

Table 3. *Predicting Qualified Elementary and Secondary Public School Teachers Nationally: Reduced Logistic Regression Models for the 1993-94 School Year for Teacher Certification and Degree Level*

Predictor Variable		Teacher Qualification			
		Full Certification		Masters Degree	
		Elementary	Secondary	Elementary	Secondary
Name	Level[a]	Odds Ratio[b]	Odds Ratio[b]	Odds Ratio[b]	Odds Ratio[b]
Situational Variable					
Community Type	Central City	0.54***	0.65***	1.37***	1.52***
	Suburban	1.25	0.88	1.41***	1.80***
	Rural				
Teacher Characteristic Variables					
Race	White	2.13***	2.00***		
	Non-White				
Teaching Experience	12 plus years	15.00***	11.06***	9.22***	8.38***
	5 – 11 years	4.81***	4.24***	4.67***	3.35***
	2 – 4 years	2.08***	1.89***	1.53	1.48**
	First year				
Teacher Working Conditions					
Classroom	Self-Contained	1.52*			
	Not Self-Contained				
Employment Status	Regular Full-Time	1.57*	1.69***		0.76***
	Irregular/Part-Time				
Teaching Field	General Elementary	1.71**	-----	0.48***	-----
	General Secondary	-----	1.29*	-----	0.72***
	Physical Ed/Health	3.42***	2.75***	0.43***	0.50***
	Vocational Ed	0.83	1.72***	0.38	0.52***
	Special Education				
Percent Minority Students	20 % or higher				0.87**
	19 % or lower				
Concordance Index (c)[c]		0.788	0.668	0.746	0.693
GOF Test (χ^2)[d]		$p>.02$	$p>.02$	$p>.05$	$p>.05$

Note. Data from the 1993-94 Schools and Staffing Survey, National Center for Education Statistics, USDE.

[a]The dependent variables were coded as follows: fully certified=1 vs partly certified=0; master's degree or higher=1 vs bachelor's degree or lower=0. The predictor variables were all treated as indicator variables with the lower level listed as the reference category coded as "0." The other (comparision) levels were coded as "1."

[b]Ratio of the odds of being full certified (vs partly certified), and having a master's degree or higher (vs having a bachelor's degree or lower), respectively (*$p<.05$, **$p<.01$, ***$p<.001$). The SAS formula for converting an odds ratio to its Beta weight is LOG(OR).

[c]The concordance index (c) estimates the probability that the model correctly orders a randomly selected pair of teachers (e.g., one fully certified, the other partly certified). It is equal to the area under a receiver operating characteristics curve (ROC), defined on the basis of model estimated predicted probabilities, and is arithmetically equivalent to one-half Summer's D rank correlation index plus 0.5.

[d]Hosmer-Lemeshow Goodness-of-Fit Test.

TABLE 4. **SOME NON-PREDICTORS OF TEACHER QUALIFICATIONS**

1. PERCENT MINORITY STUDENTS

2. TEACHERS WITH HIGH CLASSROOM CONTROL VS. LESS CONTROL

3. TEACHER GENDER

4. TEACHER MARITAL AND FAMILY STATUS

Teacher Certification and Turnover

As shown in Table 1, the percentage of partly certified teachers was three times greater for transitional teachers than for established teachers. Among those included in the definition of transitional teachers are teachers who represented two types of recent turnover: moving from one school to another and switching from one main teaching assignment to another. A third type of turnover is leaving the ranks of employed teachers, or exit attrition. The percentage of partly-certified teachers within each type of turnover is shown in Table 5.

From the perspective of enhancing the percentage of fully certified teachers, the data of Table 5 suggest that teacher turnover is might be a blessing because more partly-certified teachers are involved in turnover than are teachers who have become stable in their positions. However, this is not so because other studies with SASS have found that teachers who move to a different school, or who switch main teaching assignments, are twice as likely to change from fully certified to partly certified status than are teachers who remain in their main teaching assignments (Boe, Bobbitt, Cook, Barkanic, & Maislin, 1998). These latter facts are supportive of policies and other initiatives that are effective in creating a very stable school faculty.

With respect to exit attrition, the percentage of partly-certified teachers among those who leave teaching employment is twice as high as that of teachers who become established in their positions. Nonetheless, that still means that 90% of leavers are fully certified. Except for weeding out unqualified teachers for whom upgrading to qualified status is difficult or impossible, the attrition of so many qualified teachers is doubly regrettable because open positions are thus created for hiring entering teachers--a group that are the least qualified of all the categories of teachers analyzed here (see Table 1). Thus, all reasonable effort and expense to improve the retention of qualified teachers, and upgrading of qualifications of many of those who are not fully qualified, have the most promise of improving the overall qualifications of the teaching force.

Conclusion

A summary of critical factors in developing a highly qualified teaching force, especially as indicated by certification status, is presented in Table 6. In reviewing these factors, it might seem that much of this is just common sense and well known from professional experience. To the extent that this is true, it is reassuring because the convergence of

Table 5. **PERCENTAGES OF PARTLY CERTIFIED TEACHERS IN US PUBLIC SCHOOLS AS A FUNCTION OF TURNOVER STATUS: 1993-94**

	Partly Certif. Percentage
I. School Transfer	
A. School Reassignment: Same District	9%
B. School Migration: Different District	12%
II. Teaching Assignment Transfer	
A. Switched with Same Broad Cognate Area	11%
B. Switched between Broad Cognate Areas	14%
III. Left Teaching Employment: Exit Attrition	10%
IV. Established Teachers	<5%

Data Source: 1993-94 Schools and Staffing Survey and 1994-95 Teacher Followup Survey

Table 6. **CRITICAL FACTORS IN DEVELOPING A HIGHLY QUALIFIED NATIONAL TEACHING FORCE**

FUNCTION	MAXIMIZE	MINIMIZE
HIRE	1. EXPERIENCED TEACHERS 2. TRAINED FIRST-TIME TEACHERS	1. UNTRAINED FIRST-TIME TEACHERS
TRANSFER		1. SCHOOL TRANSFER 2. SWITCHING SUBJECT MATTER FIELDS
RETAIN	1. RETENTION OF EXPERIENCED TEACHERS 2. RETENTION OF TEACHERS IN THE SAME SCHOOL AND FIELD 3. INSERVICE TRAINING OF MINORITY TEACHERS 4. REGULAR FULL-TIME TEACHER EMPLOYMENT 5. ATTRACTIVENESS OF URBAN SCHOOLS	
SEPARATE	1. ATTRITION OF UNDER-QUALIFIED TEACHERS	1. ATTRITION OF FULLY QUALIFIED TEACHERS

two sources of information (common sense and SASS data) gives us more confidence in the validity of both. If SASS largely validates common sense with respect to the issues examined here, how has SASS increased our understanding? Let us suggest a few insights that SASS has contributed to our perspective on developing a highly qualified teaching force:

- The degree to which entering teachers lack full certification is important to know. It seems to be extremely high, and signals a major problem for improving the quality of the teaching force.
- The degree to which it is important to create the conditions for teachers to remain stable in their main teaching assignment instead of transferring school, switching field, or cycling in and out of the ranks of employed teachers.
- The overwhelming importance of retaining teachers with extensive experience to improve other indices of qualifications such as full certification and graduate degrees.
- The negligible importance of other factors (such as percent minority enrollment in schools and teacher ability to assert classroom control) are often erroneously thought to be related to teacher qualifications.

These and other findings are indicative of the potential of SASS analyses to shed light on critical issues in the national teaching force. There is still untapped potential in SASS to learn more about teacher qualifications. Data from the fourth administration of SASS currently underway (Spring 2000) will yield further research opportunities to understand the current status of, and trends over time in, teacher qualifications.

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